

## SEVERE BIRTH ASPHYXIA: RISK FACTORS AS SEEN IN A TERTIARY INSTITUTION IN THE NIGER DELTA AREA OF NIGERIA.

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### ABSTRACT

#### BACKGROUND:

Severe birth asphyxia has remained a major contributor to perinatal and neonatal mortality in developing countries including Nigeria. Efforts at curbing its incidence must begin by obtaining its prevalence and identifying associated risk factors.

#### OBJECTIVE:

To determine the incidence of severe birth asphyxia and common risk factors in Port Harcourt South-South Nigeria.

#### METHODS:

A prospective case-control study of 98 serially recruited newborns with severe birth asphyxia (Apgar score 1-3 within the first minute of birth or  $\leq 5$  at 5 minutes) and other 98 in identical weight bracket with normal Apgar scores (8-10 in the first minute of life) consecutively recruited as control was carried out in the labour and isolation wards and the main theatre of the Obstetrics and Gynaecology Department of the University of Port Harcourt Teaching Hospital Port Harcourt from the 31<sup>st</sup> March to 31<sup>st</sup> August 2004. Other relevant data obtained by participation in the delivery, examination of babies and referral to antenatal case notes included the birth weight and gestational age of recruited newborns; parity, booking status, antenatal visits, problems in pregnancy and labour and causes of delay prior to appropriate intervention in labour in the mothers where applicable. The total number of live births delivered over the study period was calculated from the obstetric registers in the labour and isolation wards and the theatre. Data was arranged in frequency tables and analysed using statistical soft ware EPI-info version 6.04. Student t test was used to compare the means of variables.  $P < 0.05$  was significant.

#### RESULTS

The incidence of severe birth asphyxia was 45 cases per thousand live births. There was no significant difference in gestational age and birth weight of subjects and control. Significantly more mothers of the subjects than of the controls were primiparous 58(59.1%) vs.44 (44.9%)  $P=0.045$ . Twenty five (25.5%) of mothers of subjects booked in the third trimester and were significantly more than 7(7.1%) of mothers of the control who booked over the same period  $P=0.001$ . Significantly more mothers of the control 29(29.6%) than of subjects 17(17.4%) made up to 10 or more antenatal visits prior to delivery  $P=0.045$ . Sixty eight (69.4%) of mothers of subjects had pregnancy complications and were significantly more than 34 (34.7%) of mothers of control with pregnancy complications  $P=0.000$ . Prolonged labour was the commonest pregnancy complication in mothers of subjects and control but occurred significantly more in mothers of subjects than mothers of control 20(20.4%) vs 6(6.1%)  $p=0.003$ . Significantly more mothers of the subjects 42(42.9%) than of control 20(20.4%) were delivered by emergency Caesarian section. Also 20 (20.4%) of mothers of subjects had delay prior to appropriate intervention in labour and were significantly more than 6 (6.1%) of mothers of control in same category.  $P=0.004$ .

#### CONCLUSION

Efforts aimed at encouraging all pregnant women especially the primiparous to register early and be consistent in attendance for antenatal care should be intensified to reduce the prevalence of severe birth asphyxia. Also health education to all women on prompt identification of danger signs during pregnancy and the need to present early to hospital when such occur will go a long way towards curbing the prevalence of birth asphyxia in the community.

**KEYWORDS:** Newborn, first-minute, apgar score, Port Harcourt.

## INTRODUCTION

Birth asphyxia is recognized as an important cause of neonatal morbidity and mortality, fresh still birth and long term neurodevelopmental sequelae globally( Suzie *et al*, 2009 ) World Health Organisation (WHO) estimates that between four and nine million newborns worldwide suffer birth asphyxia annually with most occurring in developing countries including Nigeria.(WHO,1998; Palsdotir *et al*, 2007; Ellis 2000 ; Udoma 2001) Twenty five to sixty percent of this number die or develop severe neurodevelopmental complications (Abhay *et al*, 2005; Ellis and Dharma,1999):

Risk factors for birth asphyxia abound worldwide particularly in developing countries. Socio-economic problems, negative traditional practices and religious beliefs which hinder utilization of appropriate health care services generally in developing countries such as low women empowerment, illiteracy, patronage of spiritual churches and untrained traditional birth attendants for abdominal massage in pregnancy and delivery, poor access in riverine terrain and lack of medical infrastructure are particularly rife in Niger Delta communities further predisposing pregnant women to delivery of asphyxiated babies.( Udoma *et al*, 2002; Ugboma and Akani , 2004; Etuk *et al*,2000; Gharoro and Okonkwo,2000)

There is dearth of publications on the incidence and risk factors of severe birth asphyxia in Niger Delta area of Nigeria. This study was therefore undertaken to determine the incidence and common risk factors of severe birth asphyxia in the University of Port Harcourt Teaching Hospital and to evaluate measures that can be adopted to prevent and manage them.

## SUBJECTS AND METHODS:

This was a prospective case control study conducted at the Obstetrics and Gynaecology and Paediatrics Departments of University of Port Harcourt Teaching Hospital Port Harcourt (UPTH) between 1<sup>st</sup> March and 31<sup>st</sup> August 2004.

UPTH, located in Port Harcourt, capital of Rivers State was founded in the year, 1979 and became baby friendly in the year 1993. Though a tertiary health care institution, it also serves as a secondary health care centre since there is only one other secondary health care centre in the densely populated city of Port Harcourt. It is usually well attended because it serves both as a secondary health care centre and referral centre for peripheral hospitals in Rivers State and beyond. It has an annual delivery rate of approximately 3000.

Approval was obtained from the Ethics committee of the hospital before the study was commenced.

One hundred and one severely asphyxiated newborns delivered in the labour and isolation wards and the main theatre of the hospital were serially recruited as study subjects. Apgar scoring was used to determine the degree of birth asphyxia. The author attended the deliveries and did the Apgar scoring of most of the high risk pregnancies delivered over the 6 month study period.

Apgar scoring of the newborn was done within the first minute of life and at 5 minutes. Scores of 1-3 in the first minute of life and 5 or less at 5 minutes signified severe birth asphyxia (Palsdotir *et al*, 2007). Apgar score of 8-10 within first minute of life was taken as normal (Palsdotir *et al*, 2007). When it was not feasible for the author to attend a particular delivery a resident on special care baby unit posting who had participated competently in the rehearsal of the Apgar scoring technique attended the delivery and did the Apgar scoring. Newborns whose mothers refused informed consent or with major congenital malformations such as cyanotic congenital heart disease, severe meningomyelocele, anencephaly were excluded from the study. Out of the first 101 serially recruited babies delivered in UPTH with severe birth asphyxia and satisfying the inclusion criteria, the mothers of three died post-partum before relevant information could be obtained from them so 98 severely asphyxiated newborns were ultimately enrolled as study subjects for further analysis. The first 98 consecutive newborns in identical weight brackets with Apgar scores 8-10 were recruited as control. Each recruited newborn was weighed on an infant weighing scale. Each severely asphyxiated baby was resuscitated using the standard protocol. The gestational age of each recruited newborn was determined using the Dubowitz method (Dubowitz *et al*, 1970). All babies of low birth weight were classified as small for gestational age, appropriate or large for gestational age using Olowes chart (Olowu , 1981).

Structured questionnaire was used to interview mothers consenting to the study to obtain information on personal data, preconception medical, pregnancy and birth history, family and social history and causes of delay

prior to reception of appropriate intervention in labour as applicable. During the study period, the two residents on each 3 month Special Care Baby Unit (SCBU) posting were recruited and participated in the study. Therefore a total of 4 residents on SCBU posting took part.

Information on gestational age of mothers at booking, number of antenatal visits, problems in pregnancy and labour, drugs administered in pregnancy and labour, and labour duration for mothers whose labour started in the hospital was obtained from pregnancy and obstetric record of the mothers.

For each selected newborn, the duration of labour for mothers whose labour started before arrival at the hospital was estimated as the time interval between the onset of labour pain that did not allow the mother any other activity (in the primiparous) to the moment of complete expulsion of the baby while in the multiparous it was estimated as time interval before onset of regular painful abdominal contractions and the moment of complete expulsion of the baby. For the mothers whose labour started in the hospital the duration of labour was calculated from the obstetric partogram. Prolonged labour was taken as labour lasting more than 24hours while prolonged rupture of membrane was taken as rupture of membrane lasting more than 24hours. The total number of live births delivered during the study period was obtained from the obstetric registers of the labour and isolation wards and the theatre.

Data was arranged in frequency tables and results were analysed using statistical soft ware EPI-info version 6.04 and SPSS version 11.0 Student t test was used to compare means of variables. P values <0.05 were considered as significant.

## RESULTS

The total number of live births delivered during the study period was 2206. Only 101 of them were severely asphyxiated and of these the mothers of 3 died post partum before relevant information could be obtained from them so only 98 newborns with severe asphyxia were enrolled as subjects of further analysis. These consisted of 54 males and 44 females with male female ratio of 1:2:1. The prevalence rate of severe birth asphyxia obtained was 45 cases/1000 live births. Ninety-eight new born (57 males, 41 females) in identical weight bracket were enrolled as controls with male: female ratio of 1:3:1.

The mean gestational age of the subjects was  $37.2 \pm 1.18$  weeks (range 31-42 weeks) while the mean gestational age of the control group was  $37.04 \pm 1.0$  weeks (range 31-43 weeks) with no significant difference between them  $P=0.559$ . Table I

The mean birth weight of the subjects was  $2684.86 \pm 290$  grams (range 1200-4990 grams) whereas the mean birth weight of the controls was  $2789.90 \pm 166$  grams (range 1250-4370 grams) with no significant difference in birth weight of both categories  $P=0.226$ . Table II

Eighteen (18.5%) of the subjects were small for gestational age (SGA) but this number is not significantly more than 15(15.5%) of the control that were SGA  $P=0.350$ . Two (2.1%) of subjects were large for gestational age (LGA) while 1 (1%) of the control was LGA with no significant difference in this birth weight category between the subjects and control.

Antenatal data of mothers of subjects and control:

Place of booking:

Seventy one (72.4%) of mothers of subjects and mothers of all controls (100%) booked at the Teaching Hospital with no significant difference in places of booking between them  $P=0.071$ . Seventy-nine (80.7%) of mothers of control booked in the second trimester and this was significantly more than 52(53.3%) of mothers of subjects who booked at the same period  $P=0.000$ . Seven (7.1%) of mothers of subjects were unbooked. Twenty-five (25.5%) of mothers of subjects booked in the third trimester and were significantly more than 7(7.1%) of mothers of control who booked over the same period.  $P=0.001$

Number of antenatal visits prior to delivery:

Twenty nine (29.6%) of mothers of subjects and 17(17.4%) of mothers of control made up to 10 antenatal visits prior to delivery. Also, 31 (31.5%) of mothers of subjects and 11(11.5%) of mothers of control made 6 or less antenatal visits prior to delivery. Mothers of control made significantly more antenatal visits than those of subjects  $P=0.045$

Parity of mothers of subjects and control:

The mean parity of mothers of subjects is 1.2 (range 0-6). The mean parity of mothers of control is 1.6(range 0-6).

Majority (59.1%) of mothers of subjects were primiparous compared with 44 (44.9%) of mothers of control. There is a significant difference in parities of mothers of subjects and control  $P=0.045$ .

Pregnancy and labour complications in the mothers of subjects and control:

Pregnancy complications occurred in 68 (69.4%) of mothers of subjects and this number was significantly more than 34 (34.6%) of mothers of control who developed pregnancy complications  $P=0.000$ . Preeclampsia was the most common pregnancy complication in both mothers of subjects 33(33.6%) and control 11(11.3%) but occurred significantly more in mothers of subjects  $P=0.000$ .

Prolonged labour and prolonged rupture of membrane were the commonest labour complications in both mothers of subjects and control but occurred more significantly in mothers of subjects than those of control: 20(20.5%) vs 6 (6.1%)  $P= 0.003$ ; 18(18.5%) vs 5(5.1%)  $P= 0.004$  respectively.

Forty-six point eight percent of the subjects were given drugs in labour and these were significantly more than 12.2% of control who received drugs in labour. Other details are shown in Table III.

Mode of delivery:

Seventy eight (79.6%) of mothers of control and 54(55.1%) of mothers of subjects had spontaneous vertex delivery with the difference between them being statistically significant  $P=0.000$ . Also, 42(42.9%) of the mothers of subjects were delivered by Caesarian section and were significantly more than 20(20.4%) of mothers of control delivered in similar manner  $P=0.001$ .

Significantly more mothers of subjects (20.4%) suffered delay prior to receiving appropriate intervention in labour when compared with the mothers of control (6.1%) who had a delay prior to intervention  $P= 0.004$ . Table IV indicates other details.

Table 1 Gestational age of enrolled subjects and control

Gestational Age (weeks)	Number of subjects	%	Mean GA $\pm$ SD	Number of controls	%	Mean GA $\pm$ SD	P Value
<37	25	25.51	33.0 $\pm$ 2.23	23	23.5	33.7 $\pm$ 2.03	$P=0.559$
37-41	70	71.43	38.6 $\pm$ 1.33	74	75.4	38.0 $\pm$ 0.97	
>41	3	3.06	42.0 $\pm$ 0.0	1	1.0	43 $\pm$ 0.00	

SD = Standard deviation, GA = Gestational age

Table 2 Birth weight of enrolled subjects and control

Birth weight (Grams)	Number of subjects	%	Mean BW $\pm$ SD	Number of controls	%	Mean BW $\pm$ SD	P Value
<1500	12	12.24	1290 $\pm$ 100	6	6.12	1317 $\pm$ 69	$P=0.223$
1500-2499	13	13.27	1969 $\pm$ 329	19	19.39	1980 $\pm$ 280	
2500-4000	70	71.43	3172 $\pm$ 443	71	72.45	3079 $\pm$ 284	
>4000	3	3.06	4550 $\pm$ 439	2	2.04	4350 $\pm$ 23	

SD = Standard deviation, BW = Birth weight

Table 3

Drugs given in labour to mothers of subjects and control.

Drugs given in labour	Number of mothers of subjects	%	Number mothers of control	%	P-value
No drugs	56	57.2	86	87.8	0.000
Hydralazine	15	15.4	2	2.0	0.001
Pentazocine	12	12.3	0	0.0	0.477
Oxytocin	7	7.1	5	5.1	0.21
Diazepam	2	2	0	0.0	0.477
Aldomet	2	2	0	0.0	0.477
Ampiclox	2	2	5	5.1	0.477
Flagyl	2	2	0	0.0	0.477

Table IV : Causes of delay prior to intervention in labour in mothers of subjects and control.

Cause of Delay.	Number of mothers of Subjects.	%	Number mothers of control	%	P-value
No delay prior to intervention	78	79.7	92	93.9	
Mother's late recognition of labour	6	6.1	4	4.1	
Labour initially managed in maternity	5	5.1	2	2.0	
Delay in transportation	4	4.1	0	0.0	
Delay in consent for operation	2	2.0	0	0.0	
Labour initially managed by T.B.A	2	2.0	0	0.0	
Financial constraint	1	1.0	0	0.0	

P = 0.004

T.B.A Traditional birth attendant.

## DISCUSSION:

The prevalence of severe birth asphyxia in any community is to a large extent dependent on prevailing risk factors, these in turn being influenced by the extent and impact of health education, literacy level, women empowerment, cultural and traditional beliefs affecting efficient utilization of health care services as well as the quality of antenatal, obstetric and neonatal care. (Dubowitz *et al*, 1970). Poverty, ignorance, poor communication network, harmful traditional and cultural practices with significant negative effect on utilization of appropriate health care services by women in pregnancy and labour are particularly rife in the developing countries, the Niger Delta region of Nigeria inclusive (Dubowitz *et al*, 1970). The prevalence rate of severe birth asphyxia of 45 cases per thousand live births obtained in this study is unacceptably high like previous results obtained from different parts of Nigeria – 63 cases per thousand live births reported from Benin ( Omene and Diejomaoh,1978) 25 cases/1000 live births reported from Jos (Airede, 2000) and 36/1000 live births reported from Ife.( Okwu and Olomu,1996). The higher value than those of Jos and Ife obtained in this study could be due to high patronage of private maternities and unorthodox places by pregnant women for antenatal care and delivery even for some after booking in hospitals and clinics due to high cost of health care service delivery in Port Harcourt. (Ugboma and Akani ,2004; Gharoro and Okonkwo ,2000; Okwu and Olomu , 1996). Many of these cases result in complicated pregnancy and labour often with late referral to the Teaching Hospital with a significant proportion resulting in severe birth asphyxia or even still birth (Ade-Oja and Loto, 2008)

Majority of the asphyxiated newborns were of birth weight equal to or more than 2,500grams compared with the number that were of low birth weight.

This is in agreement with previous reports by Oruamabo from this centre and others (Etuk *et al*, 2000; Uzoigwe and John, 2004; Udoma *et al*, 2003) that mature and larger newborns are likely to be associated with fetopelvic disproportion, resulting in prolonged or obstructed labour and birth asphyxia as compared with low birth weight babies.

There was no significant difference in the birth weight distribution between the subjects and control in this analysis probably because the subjects and control in identical weight brackets were recruited to assess the risk factors for birth asphyxia.

This study reveals that significantly more mothers of control than of subjects booked in second trimester while significantly more mothers of subjects than of control booked in the third trimester. Also, mothers of control had significantly more antenatal visits prior to delivery than mothers of subjects. This highlights one of the major problems in pregnancy with women in developing countries – poor utilization of appropriate health services in pregnancy and labour as noted previously by several authors (Palsdotir *et al*, 2007; Udoma *et al*, 2003; Imogie *et al*, 2002; Adeoye *et al*, 2005). Significant numbers of mothers of asphyxiated babies were either un-booked, booked late, booked in unorthodox places or have low frequency of antenatal visits prior to delivery (Ade-Oja and Loto 2008)

There was no significant difference in the place of booking of mothers of subjects and control but five of eight and two of three mothers of subjects who booked in private maternities and with traditional birth attendants (TBAS) respectively, had delayed referral to the Teaching Hospital in labour. The operators and staff of these private maternities and TBAS are often not trained adequately to recognize promptly pregnancy and labour complications demanding immediate referral hence the usual delay often resulting in birth asphyxia (Imogie *et al*, 2002)

The result of this study also highlighted primiparity as a significant risk factor for severe birth asphyxia. This is in corroboration of previous reports by several authors (Ellis *et al*, 2000; Palsdotir *et al*, 2007; Wu *et al*, 2004). The primiparous are often ignorant of the demands of pregnancy and their responsibility to themselves and their unborn foetus often neglecting early booking and regular attendance to antenatal care (Adeoye *et al*, 2005) This may result in complications that lead to severe birth asphyxia.

Pre-eclampsia was also observed as a significant pregnancy complication in mothers of subjects in the study. Pre-eclampsia has also been severally reported previously as a risk factor for severe birth asphyxia (Ellis *et al*, 2000; Palsdotir *et al*, 2007; Wu *et al*, 2004)

Preeclampsia if prolonged is associated with reduced blood supply, nutrients and oxygen to the fetus resulting in intrauterine growth restriction (Macgillivray *et al*, 2000). This complication in itself can be associated with birth asphyxia (Ellis *et al*, 2000). In labour, management of severe preeclampsia often includes use of antihypertensive and sedatives such as diazepam and lorazepam which have depressive effect on the respiratory centre, further exacerbating the asphyxiogenic effect on the fetus. Early detection and prompt management of pre-eclampsia during antenatal period reduce this complication.

Prolonged labour and prolonged rupture of membrane were observed as significant labour related risk factors in mothers of asphyxiated babies. Such reports have been published previously by other authors (Ellis *et al*, 2000; Palsdotir *et al*, 2007). Prolonged labour is often associated with foetal distress and sometimes foetal and maternal exhaustion which often result in birth asphyxia. Also, prolonged labour often results in delivery by Caesarian section. If this is done using general anaesthesia, some of the agents and adjuncts such as diazepam may further depress the newborn at birth. Prolonged rupture of membrane may be associated with intrauterine infection resulting in birth asphyxia (Ellis *et al*, 2000). Regrettably, some mothers even book in appropriate places only for the purpose of delivery without presenting for further antenatal supervision often resulting in development of pregnancy complications possibly leading to birth asphyxia (Adeoye *et al*, 2005). Pregnancy and labour complications contributing to occurrence of SBA in this study were likely to have resulted from inadequate supervision of pregnancy and labour in the mothers of the subjects. This therefore underscores the need for early booking in pregnancy, regular attendance for antenatal supervision and delivery in appropriate health care facilities.

Significantly more mothers of subjects than of control were delivered by emergency Caesarian section. Birth asphyxia in those subjects might have resulted from the indication for the Caesarian section or drugs administered prior to or during operation.

It was also observed that delay prior to reception of appropriate intervention in labour was a significant risk factor for severe birth asphyxia in our study. The main reasons of delay were mothers' late recognition of labour 30%; prior management of labour in private maternities 25% and delay in transportation 20%. Delay in transportation from reverine communities is often due to the difficult terrains and water ways encountered between these localities and the city of Port Harcourt where the Teaching Hospital is located.

Limitation of the study: Inability to obtain reliable information on the treatment modalities of mothers of recruited newborns who were not booked in the University of Port Harcourt Teaching Hospital.

Application of study: Early identification of high risk pregnancies such as the primiparous, those with poor antenatal supervision, pre-eclampsia, prolonged labour, prolonged rupture of membrane and prompt referral to appropriate health facility with adequate equipment and staff including obstetricians, paediatricians and anaesthesiologists for further management of pregnancy or labour as applicable will go a long way in curbing the incidence of birth asphyxia in the community.

## CONCLUSION

The prevalence of severe birth asphyxia in Port Harcourt is unacceptably high. To curb this trend, urgent measures including health education of the general populace on the need for early booking and regular attendance of appropriate health facilities by pregnant women for antenatal supervision and delivery should be commenced now. Pregnancy related issues should be included in school curricula for adolescents. There is an immediate need for organization of regular workshops and seminars for TBAS, employees of public and private health institutions emphasizing the need for early identification and prompt referral of complicated pregnancies and labour to appropriate health care institutions.

Finally, the government at local, state and federal levels must demonstrate sustained commitment to the provision of efficient ambulance services and good network of roads.

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